Cilia-driven Flows: from Mechanics to Biological Function

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Motile cilia are hair-like protrusions from epithelial cells that beat collectively to transport fluid. On the tissue level, cilia serve diverse biological functions, such as mucociliary clearance in the airways and cerebrospinal fluid transport in the brain ventricles. Yet, the relationship between the structure and organization of ciliated tissues and their biological function remains elusive. Here, I will present a series of models that examine the role of cilia-driven flows in particle transport, mixing, capture and filtering. I will conclude by commenting on the implications of these models to understanding the biophysical mechanisms underlying the interaction of ciliated tissues with microbial partners.

Eva Kanso is a professor and the Z.H. Kaprielian Fellow in Aerospace and Mechanical Engineering at the University of Southern California. Prior to joining USC, Kanso held a two-year postdoctoral position in Computing and Mathematical Sciences at Caltech. She received a Ph.D. and an M.S. degree in Mechanical Engineering as well as an M.A. degree in Mathematics from UC Berkeley. Kanso's research interests lie in the area of bio-inspired engineering in application to underwater (collective) motion and the biophysics of cellular and sub-cellular phenomena.